Studies on Victorian bryophytes 2. The genus *Bazzania* Gray

David Meagher[1]

Abstract
Three species of the liverwort genus *Bazzania* occur in Victoria: *B. adnexa* var. *adnexa*, *B. hochstetteri* and *B. monilinervis*. These are described and illustrated, and their distributions in Victoria are delineated. *Bazzania involuta* is discounted from the Victorian flora. A key to the species is provided.
(*The Victorian Naturalist* **123** (1), 2006, 41–46)

Introduction

The family Lepidoziaceae is represented in Australia by 12 genera: *Acromastigum*, *Bazzania*, *Drucella*, *Hygrolembidium*, *Isolembidium*, *Kurzia*, *Lepidozia*, *Paracromastigum*, *Pseudocephalozia*, *Psiloclada*, *Telaranea* and *Zoopsis* (McCarthy 2003). All except *Isolembidium* are present in Victoria. The genera *Acromastigum* and *Bazzania* are grouped together in the subfamily Bazzanioidea, which consists of species with two rows of incubous lateral leaves, one row of underleaves, and minute-leaved ventral branches called flagella.

In almost all species of *Bazzania* the branches tend to grow as strongly as the stem from which they arise, so that the branching is distinctly Y-shaped and resembles dichotomous branching. For this reason, such branching is called 'pseudodichotomous'. In a very few species of *Bazzania*, including *B. involuta* of New Zealand and Tasmania, the branches are much weaker than the continuing stem and the branches are oriented more or less at right angles to the stem. This form of branching is called 'lateral'. In *Bazzania* the lateral branches are of the *Frullania* type; that is, the branch replaces the ventral half of a lateral leaf, leaving the other half of the leaf in the branch junction on the dorsal side. The flagella arise from ventral intercalary branching in the axils of underleaves, thus leaving underleaves intact. (In *Acromastigum* the flagella arise from ventral terminal branching, so the branch replaces half an underleaf.)

Scott (1985) reported only *B. involuta* and *B. monilinervis* from southern Australia, as he considered *B. adnexa* to be conspecific with *B. involuta*. However, *B. adnexa* differs from *B. involuta* in several respects (see under the description of *B. adnexa*), and *B. involuta* does not occur in any of the many collections from Victoria. It is therefore discounted here from the Victorian flora. An additional species, *B. hochstetteri*, has since been found in Victoria, and there are several other species in Tasmania and New South Wales.

[1]School of Botany, The University of Melbourne, Victoria 3010

Similar taxa

Of the other genera of Lepidoziaceae in Australia, only *Acromastigum* is likely to be mistaken for *Bazzania* in the field, as it is the only other genus in which ventral flagella are present. In *Acromastigum* each flagellum replaces half an underleaf, the leaf apex is either bifid (two-lobed) or entire but never trifid, the underleaf is usually trifid, and the cells in the outer layer of the stem are enlarged and transparent. In *Bazzania* the flagella arise from the axils of the underleaves, the leaf apex is usually trifid (but sometimes bifid or entire), the underleaf is usually entire (but dentate or lobed in some species), and the cells of the outer layer of the stem are not enlarged and are more or less opaque. Also, *Acromastigum* plants are usually much smaller than *Bazzania* plants.

Several species of *Bazzania* from Tasmania, central New South Wales and New Zealand are similar to Victorian species, and should be kept in mind when determining unusual specimens, notably *B. accreta*, *B. novae-zelandiae* and *B. fasciculata*. Synonyms are published in McCarthy (2003).

Description of species

In the following descriptions, dimensions are included only where they are useful in distinguishing species. In general, leaf and

Key to the Victorian species of Bazzania

This key is based on features that are visible with a 10× hand lens. Field identifications should be confirmed in the laboratory using the microscopic characters mentioned in the descriptions.

1. Leaves with a distinct vitta 2–3 cells wide; leaf apices with three spreading, tooth-like lobes; underleaves distinctly ovate, ± entire ..... ***B. monilinervis***

   Leaves without a vitta (but usually with a broad patch of enlarged cells in mid-leaf); leaf apices various; underleaves not ovate, with distinctly crenulate or toothed margins 2

2. Leaf apices bifid or trifid on the same plant, lobes never with extra teeth; leaves very brittle and usually missing from much of the stem ..... ***B. hochstetteri***

   Leaves always trifid; leaf apex often armed with additional small teeth; leaves not brittle, rarely missing ..... ***B. adnexa* var. *adnexa***

cell dimensions are not useful taxonomic characters for these species. Distribution maps are based on a review of specimens in MEL, MELU, NSW and CANB. Open circles represent records more than 50 years old.

Bazzania adnexa (Lehm. & Lindenb.) Trev. var. *adnexa* (Fig. 1).
Mem. Real. Istit. Lombardo Sci. Lett. **13** (ser. 3, part 4): 414 (1877)

Known distribution in Australia: Tas, Vic (Fig. 2), NSW, ACT, Qld, Lord Howe I.

Habitat: epiphytic on trees and tree-ferns (rarely on soil) in wet sclerophyll forest and rainforest.

Plants yellow-green to dark green, forming dense, overlapping mats; **branching** frequent, pseudodichotomous, the branches of *Frullania* type; **leaves** usually spreading widely from stem, to about 1.5 mm long and 0.8 mm wide, trifid, usually with extra small teeth around apex and margins, cells mostly thin-walled, trigones minute or absent except sometimes larger in basal mid-leaf; **underleaves** wider than long, patent to semi-erect, bulging or keeled at the base, with a distinct margin of thin-walled, empty cells (sometimes eroded), margin usually weakly to strongly toothed and sometimes reflexed or incurved; **perianth** on short ventral branches, more or less tubular with an inflated centre and constricted and pleated mouth without teeth or cilia; **capsules** ellipsoidal, dark brown, on a long, slender seta; **spores** brown with ± ruminate ornamentation, elaters bispiral.

Notes: In the past, *Bazzania adnexa* has been confused with *B. involuta*. Scott (1985) treated them as a single species, and called all southern Australian material *B. involuta*. But the two are very distinct species, and almost all Australian specimens previously identified as *B. involuta* are *B. adnexa* or other species. (In *B. involuta* the branching is mostly lateral, and the underleaves are not toothed and lack hyaline cells.) *Bazzania adnexa* is by far the most common species of *Bazzania* in Victoria, forming about 90% of collections. The leaves are very variable in colour, size, shape and degree of toothing, and the underleaves also vary in shape, size, width of the hyaline margin and degree of toothing. Despite its variation, *B. adnexa* is easily distinguished from the other Victorian *Bazzania* species. All Australian plants appear to belong to the variety *adnexa*. The species' range extends to New Zealand, where the variety *aucklandica* also occurs (Engel and Merrill 1994). That variety has the underleaves constantly incurved, a condition found only intermittently in var. *adnexa*.

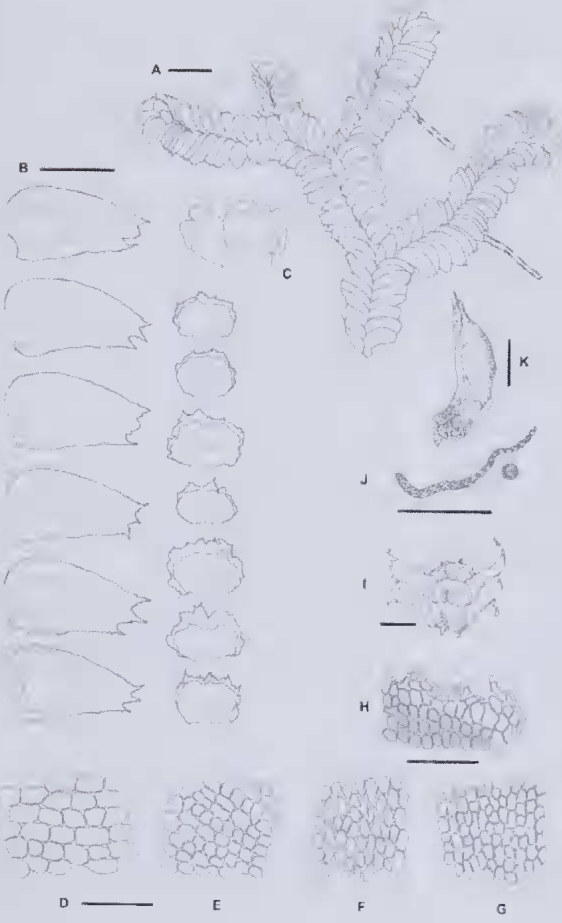

Fig. 1. *Bazzania adnexa* (Lehm. & Lindenb.) Trev. var. *adnexa*.
A Dorsal view of portion of shoot. **B** Leaves and underleaves. Dashed line in leaves indicates area of enlarged cells. Thin line in underleaves indicates area of chlorophyllose cells. **C** First branch underleaf and adjacent stem underleaf. **D** Cells in midleaf. **E** Cells in upper leaf. **F** Cells in keel of underleaf. **G** Cells in outer area of underleaf. **H** Margin of underleaf, showing border of hyaline cells and teeth. **I** Underleaves showing connection to ventral margin of leaf on both sides. **J** Elater and spore. **K** Perianth with bracts. (Scale bars: A = 2 mm, B, C, I, K = 1 mm, D–H, J = 100 µm.).

Fig. 2. Known distribution of *Bazzania adnexa* in Victoria.

Bazzania hochstetteri (Rehdt) Hodgs. (Fig. 3)
Trans. Roy. Soc. New Zealand **82** (1): 11 (1954).
Known distribution in Australia: Tas, Vic (Fig. 4), NSW
Habitat: epiphytic on trunks and branches of trees in rainforest
Plants yellow-green to mid green, forming weakly overlapping mats; **branching** frequent, pseudodichotomous, the branches of *Frullania* type; **leaves** usually spreading widely from stem, to about 1 mm long and 0.4 mm wide, trifid or bifid, without extra small teeth, fragile and often breaking, so that the lower stems may lack leaves, cells mostly thin-walled, trigones minute or absent except sometimes larger in basal mid-leaf; **underleaves** wider than long, rather wedge-shaped, patent to semi-erect, the upper 1/2 to 1/3 consisting of hyaline cells, the apex usually weakly toothed or lobed; **perianth** not seen.

Notes: This is a very rare species of *Bazzania* in south-eastern Australia, known from only a few localities in Tasmania and Victoria and one in southern New South Wales. In Victoria it is known only from warm temperate and cool temperate rainforest on Wilsons Promontory, in Tarra–Bulga National Park and in East Gippsland. Outside Australia it is known only from New Zealand. It has recently been recommended for listing as a threatened taxon under the Victorian *Flora and Fauna Guarantee Act 1988* (M. O'Brien, Executive Officer, Scientific Advisiory Committee, pers. comm. July 2005).

Bazzania monilinervis (Lehm. & Lindenb.) Trev. (Fig. 5)
Mem. Real. Istit. Lombardo Sci. Lett. **13** (ser. 3, part 4): 414 (1877)
Known distribution in Australia: Tas, Vic (Fig. 6), NSW
Habitat: epiphytic on trees and tree-ferns in wet forest and rainforest
Plants mid to dark green, usually forming dense, overlapping mats but sometimes creeping among other bryophytes; **branching** frequent, pseudodichotomous, of *Frullania* type, fully-leaved ventral branches also common; **leaves** spreading widely from stem, to about 1.2 mm long and 0.7 mm wide, distinctly trifid with narrow, spreading lobes, never with extra teeth, distinct vitta of enlarged trigonous cells close to the ventral margins, 2–4 cells wide and reaching 3/4 or more of the leaf length, cells otherwise small and thick-walled, more or less without trigones; **underleaves** longer than wide, more or less oval, often with a few small teeth at the apex, appressed to the stem, cells colourless so that underleaves are very pale in dry plants, thick-walled in lower part and thin-walled in upper part of the underleaf; **perianth** widely ovate, strongly multikeeled throughout, tapering to a narrow and slightly toothed mouth.

Notes: Although usually abundant where it occurs, this is not a common species in Victoria. It is restricted to cool temperate rainforest and tree-fern gullies in wet forest, and grows in dark, dense mats on tree-ferns and non-eucalypt trees, especially *Nothofagus cunninghamii*, sometimes among *Bazzania adnexa*. The presence of a vitta and the neat, widely spreading apical lobes, together with the colourless underleaves, make this species easy to identify in the field. In New South Wales it is known only from a single site on Mount Budawang, in the south-east of the state.

Acknowledgements
I am grateful to the curators of MEL, NSW and CANB for loans of specimens, and to Nic Middleton and Kathy Vohs (MELU) for providing facilities and arranging loans. Many thanks also to Dr John Engel (Field Museum, Chicago, USA) for valuable advice on the manuscript, and to the anonymous referee for making numerous useful suggestions for improvements.

References
Engel JJ and Merrill GLS (1994) Studies of New Zealand Hepaticae 8–13. *Bazzania* and *Acromastigum*. *The Bryologist* **97** (3) 313–320.
McCarthy P (2003) *Catalogue of Australian Liverworts*. Flora of Australia Supplementary Series No. 21. Australian Biological Resources Study, Canberra.
Scott GAM (1985) *Southern Australian Liverworts*. Australian Flora and Fauna Series No. 2. (Australian Government Publishing Service: Canberra)

Received 10 March, 2005; accepted 29 September 2005

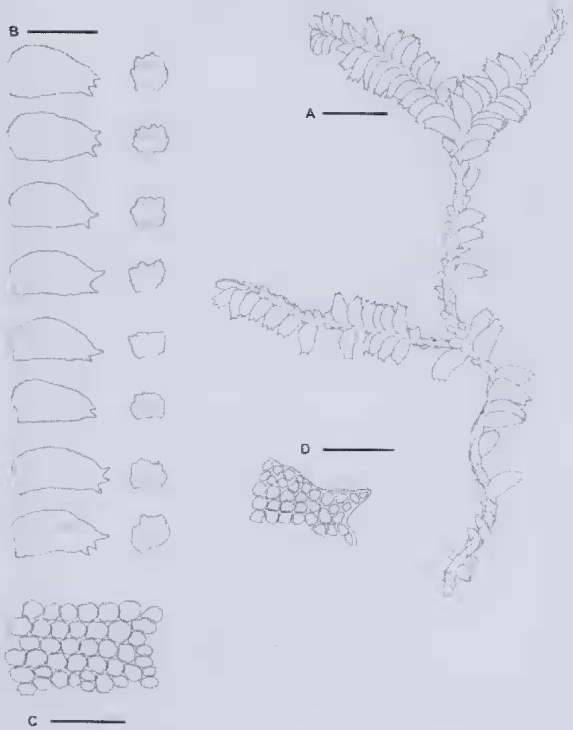

Fig. 3. *Bazzania hochstetteri* (Rehdt) Hodgs. **A** Dorsal vew of portion of plant. **B** Leaves and underleaves. Dashed line in leaves indicates area of enlarged cells. Thin line in underleaves indicates area of chlorophyllose cells. **C** Cells in mid-leaf. **D** Cells at leaf apex. **E** Underleaf. (Scale bars: A,B = 1 mm, C,D = 100 µm.)

Fig. 4. Known distribution of *Bazzania hochstetteri* in Victoria.

Glossary

incubous: inserted obliquely on the stem so that the margin nearest to the stem apex is on the upper (dorsal) side of the stem, and the margin farthest from the stem apex is on the lower (ventral) side.
patent: standing out amore or less at a right angle from the stem.
perianth: a more or less fleshy, tubular organ enclosing and protecting the developing spore capsule.
trigone: a triangular thickening of the cell walls at the junction of three cells.
vitta: an area of enlarged cells forming a narrow line running longitudinally along the leaf.

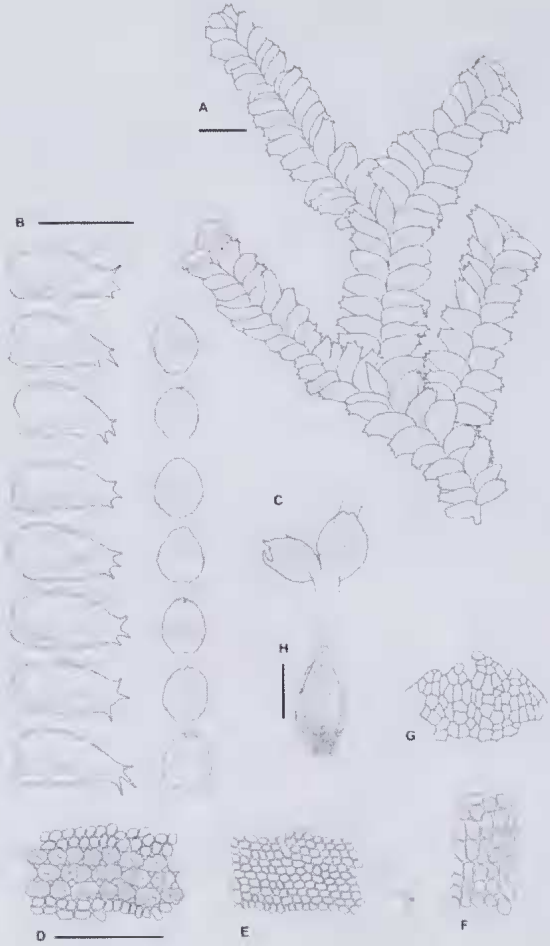

Fig. 5. *Bazzania monilinervis* (Lehm. & Lindenb.) Trev. **A** Dorsal view of portion of shoot, showing a fully leaved ventral branched on the right. **B** Leaves and underleaves. Dashed line in leaves indicates vitta. Thin line in underleaves indicates area of thick-walled cells. **C** First branch underleaf and adjacent stem underleaf. **D** Cells of the vitta (showing oil bodies) and adjacent cells. **E** Cells in upper leaf. **F** Cells in mid-base of underleaf. **G** Cells at apex of underleaf. **H** Perianth with bracts. (Scale bars: A–C, H = 1 mm, D–G = 100 µm.).

Fig. 6. Known distribution of *Bazzania monilinervis* in Victoria.